Powering Facility Neighbors with Landfill Gas

WIndiana 2011
Indiana Renewable Energy Conference
Indianapolis, Indiana
July 20-21, 2011

LANDFILL METHANE OUTREACH PROGRAM

Today's Agenda

- What is LMOP?
- Status of the LFG Energy Industry in the U.S.
- Benefits of LFG Energy/Project Incentives
- Status of LFG Energy projects in Indiana
- Case Studies
- LMOP Assistance

EPA's Landfill Methane Outreach Program

- Established in 1994
- Voluntary program that creates alliances among states, energy users/providers, the landfill gas industry, and communities

Mission: To reduce methane emissions by lowering barriers and promoting the development of cost-effective and environmentally beneficial landfill gas energy (LFG Energy) projects.

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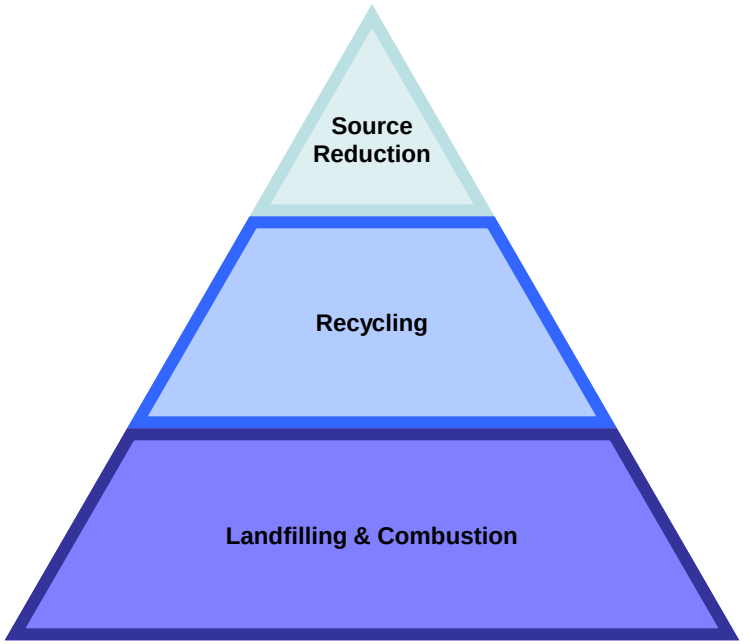
Solid Waste Management Hierarchy



LMOP supports the EPA Solid Waste Management Hierarchy (Reduce, Reuse, Recycle, and Disposal)

Source reduction, also known as waste reduction, is the preferred solid waste tactic, followed by recycling. Waste that cannot be prevented or recycled can be incinerated or landfilled.

Why EPA is Concerned about Landfill Gas

- Why is methane a greenhouse gas?
  - Methane absorbs terrestrial infrared radiation (heat) that would otherwise escape to space (GHG characteristic)
- Methane as GHG is over 21 times more effective in trapping heat in the atmosphere than CO_2.
- Methane is more abundant in the atmosphere now than anytime in the past 400,000 years and 150% higher than in the year 1750.
- Landfills were the third largest human-made source of methane in the United States in 2009, accounting for 17.1% generated.

Landfill Gas and Green Power
A Winning Combination

- Dual benefit ➔ destroys methane and other organic compounds in LFG
- Offsets use of nonrenewable resources (coal, oil, gas) reducing emissions of
  - SO_2, NO_X, PM, CO_2
- LFG is a recognized renewable energy resource
  - Green-e, EPA Green Power Partnership, 28 states, Sierra Club, NRDC
- LFG is generated 24/7 and projects have online reliability over 90%
- LFG can act as a long-term price and volatility hedge against fossil fuels

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State of the National LFG Industry (April 2011)

- At least 551 operational projects in 46 states annually supplying:
  - **13 billion kilowatt-hours** of electricity and **100 billion cubic feet** of LFG to direct-use applications
- Estimated '10 **Annual** Environmental Benefits
  - Carbon sequestered annually by **~19,800,000 acres of pine or fir forests**, or
  - CO_2 emissions from **~216,000,000 barrels of oil consumed**, or
  - Annual greenhouse gas emissions from **~17,700,000 passenger vehicles**
- Estimated **Annual** Energy Benefits
  - Powering more than **940,000 homes** and heating more than **722,000 homes**

Diversity of Project Types Using LFG

- Electric Generation (~70% of all projects)
  - Reciprocating engines
  - Turbines
  - Microturbines
  - Combined heat & power (CHP)
- Direct-Use (~30% of all projects)
  - Boiler applications
  - Direct thermal (dryers, kilns)
  - Natural gas pipeline injection
    - Medium & high Btu
  - Greenhouses
  - Leachate evaporation
  - Vehicle fuel (LNG, CNG)

Pottery Studio, NC

LFG-fired Boiler Ft. Wayne, IN

LFG Energy Projects and Candidate Landfills

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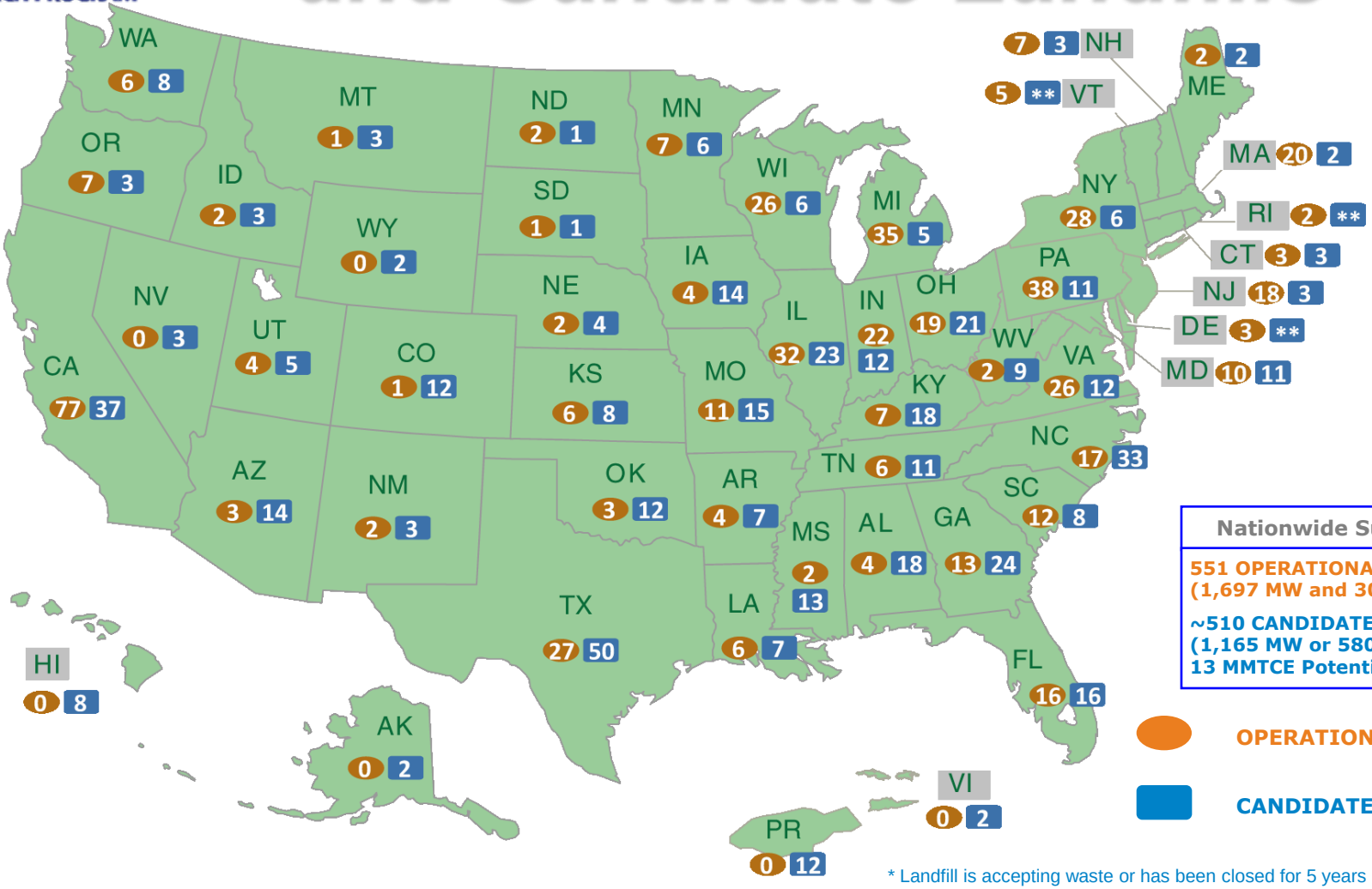

Nationwide Summary

551 OPERATIONAL Projects (1,697 MW and 309 mmscfd)

~510 CANDIDATE Landfills (1,165 MW or 580 mmscfd, 13 MMTCE Potential)

OPERATIONAL PROJECTS

CANDIDATE LANDFILLS*

* Landfill is accepting waste or has been closed for 5 years or less and has at least 1 mmtons of waste and does not have an operational/under construction LFGE project or is designated based on actual interest/planning.

** LMOP does not have any information on candidate landfills in this state.

http://www.epa.gov/lmop

These data are from LMOP's database as of April 12, 2011.

Local Economic Benefits

- LFG as a business development or retention strategy
- Job creation during construction and operation
- Local contractor use (concrete, grading, electrical, mechanical)
- Collateral benefits (lodging, food)

Potential LFG Revenue

Potential Revenue Source	Electric	Direct-Use
Sale of electricity (3– 11 cents/kWh)	X	
Sale of Renewable Energy Certificates (RECs)	X	
Tax credits or incentives	X	
Clean Renewable Energy Bonds (CREBs)	X	
Sale of LFG (~$1.50-4.00 per MMBtu)		X
Greenhouse gas reduction credits	X	X
Energy cost savings	X	X

LFG Has Been Used to Help Produce…

- Aluminum
- Alternative fuels (biodiesel, CNG, ethanol, and LNG)
- Aquaculture (e.g., tilapia)
- Arts & crafts (blacksmithing, ceramics, glass)
- Biosolids (drying)
- Bricks and concrete
- Carpet
- Cars and trucks
- Chemicals
- Chocolate
- Consumer goods and containers
- Denim
- Electronics
- Fiberglass, nylon, and paper
- Furthering space exploration
- Garden plants
- Green power
- Ice cream, milk, and tea
- Infrared heat
- Juice (apple, cranberry, orange)
- Pharmaceuticals
- Pierogies and snack food
- Soy-based products
- Steel
- Tomatoes (hydroponic)
- Taxpayer savings and increased sustainability!


Honeywell
NUCOR
HILL AIR FORCE BASE, Utah
OGDEN AIR LOGISTICS CENTER
DART
CYTEC
Rolls-Royce
SENECA Foods.com
"A World Leader In Agribusiness"
Owens Corning
Cargill
Look Who's Using Landfill Gas!
Ford
The Ultimate Driving Machine
The Solae Company
Frito Lay
GM
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SC Johnson
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LFG and State Renewable Portfolio Standards

- LFG is eligible as a renewable resource for 36 states and District of Columbia
- Renewable Portfolio Standard (RPS) – requires utilities to supply a percentage of power from renewable resources
  - 29 states plus District of Columbia have an RPS
- Renewable Portfolio Goal (RPG) – same as RPS except an objective not a requirement
  - 7 states have an RPG
  - Indiana has an RPG of 15% by 2025.

DSIRE™
Database of State Incentives for Renewables & Efficiency

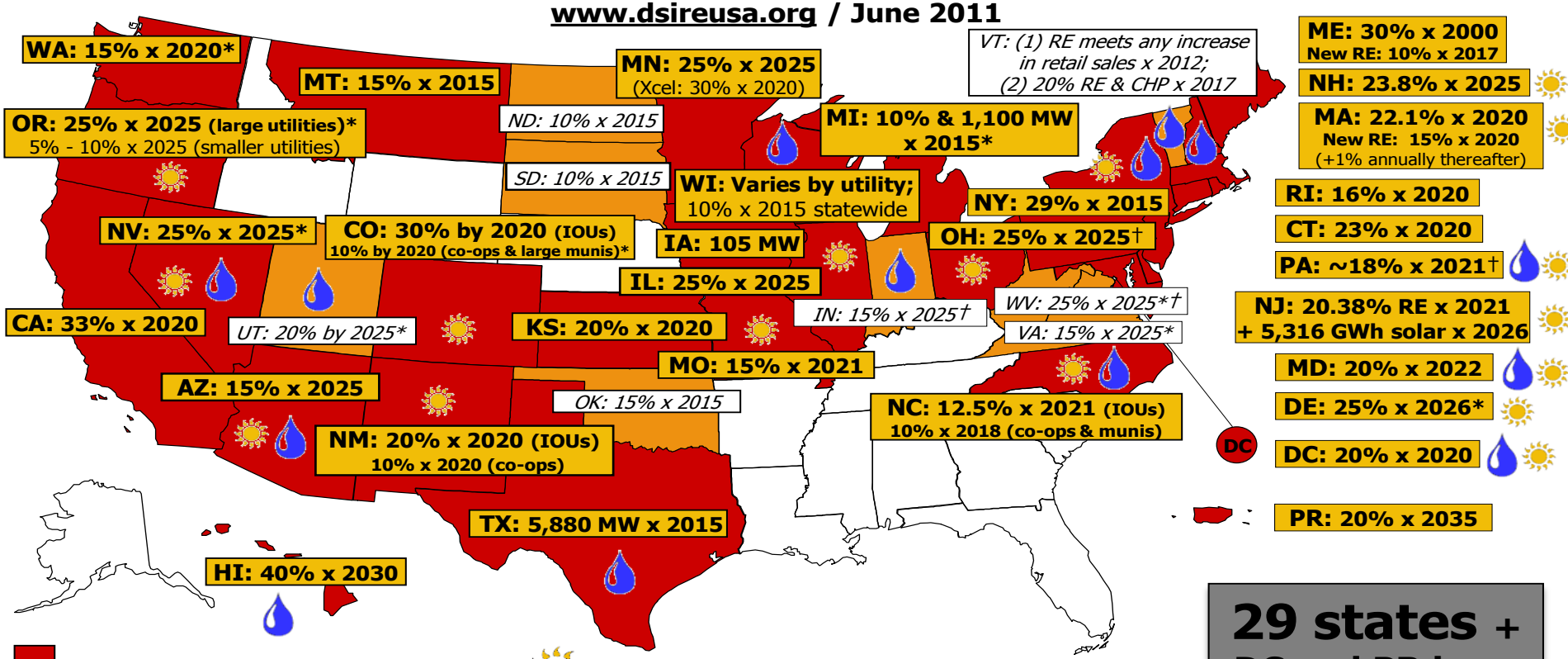
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

IREC Interstate Renewable Energy Council

North Carolina Solar Center

RPS Policies

www.dsireusa.org / June 2011



Renewable portfolio standard

Renewable portfolio goal

Solar water heating eligible

Minimum solar or customer-sited requirement

* Extra credit for solar or customer-sited renewables

† Includes non-renewable alternative resources

29 states + DC and PR have an RPS

(8 states have goals)

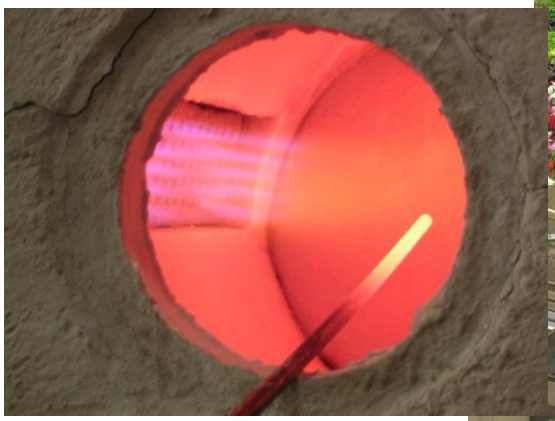
State of LFG Energy in Indiana

- 22 Operational LFG Energy Projects in Indiana
  - 50 megawatts (MW) of electricity is generated from 12 landfills
  - 12 million standard cubic feet of LFG per day is utilized in direct-use projects (greenhouses, boilers, and leachate evaporation) is generated from 10 landfills
- 12 Potential Landfills in Indiana that could operate an LFG Energy Project

Diversity of Project Types
Direct Use of LFG

- Direct-use projects are growing!
  - Boiler applications – replace natural gas, coal, fuel oil
  - Direct thermal (dryers, kilns)
  - Natural gas pipeline injection (medium- & high-Btu)
  - Ethanol production
  - Greenhouse
  - Infrared heaters
  - Leachate evaporation
  - Vehicle fuel (LNG, CNG)
  - Glassblowing & pottery
  - Blacksmithing
  - Hydroponics
  - Aquaculture (fish farming)

Greenhouse
Jackson County, NC



Glassblowing
Jackson County, NC

Infrared heater - Lorton, VA

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Greenfield Case Study
Victory Environmental Services Landfill & Boral Bricks
Terre Haute, IN

- Facility opened in 2008 and can produce up to 125 million bricks a year using 750 scfm.
- LFG is transported via a 1.2-mile pipeline.
- Largest brick production facility.

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Direct-Use Case Study

City of Sioux Falls Regional Landfill & POET Landfill Gas Energy Project (SD)

- 1,250 scfm of LFG is transported via an 11-mile pipeline to POET's ethanol plant
- Reduces the plant's natural gas usage by 2/3
- City takes advantage of the sale of carbon credits from the project, in addition to the sale of the landfill gas

LMOP 2010 Project of the Year

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Direct-Use Case Study
Newton County, IN Renewable Energy Business Park

- 2010 LMOP Project of the Year Award
- Business Park built near landfill to supply 100% of fuel needs from LFG resources

- First tenant, Urban Forest Recyclers, uses LFG in egg carton drying process
- Project may expand to supply up to 16,000 scfm of LFG to meet business park energy needs
- 1,800 foot pipeline transports LFG

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Multi-Use Case Study
IESI Landfill
Maryland Heights, MO

- Start-up in 1997
- Project highlights:
  - The landfill funded the 0.7-mile pipeline to heat the school's boilers. The LFG saves the school approximately $27,000 annually.
  - Additional LFG is used to heat a nearby greenhouse.
  - A portion of the LFG also fuels the asphalt plant at IESI.
  - **Landfill and Ameren are currently working on a 14-16MW project to go on-line in Spring 2012!**

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Electricity Case Study

Cherokee Run Landfill
Bellfontaine, OH

- Republic owned landfill that opened in 1987 and plans to close in 2018.
- 3,000 scfm flare installed in 2006 and 4.8 MW of electricity generated at the site since March 2009.
- PJM Interconnection
- Project participants, DTE Biomass Energy, Excelon, Dayton Power and Light, and Shaw Environmental were all involved in making this project a success.

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Direct-Use Case Study

Seward County, Kansas Landfill

- Project is a public/private partnership with National Beef
- 70 scfm of LFG is piped 1,500 feet to a covered wastewater lagoon
- LFG and gas from covered lagoon is captured and used to fuel boilers at National Beef

2008 LMOP Project of the Year

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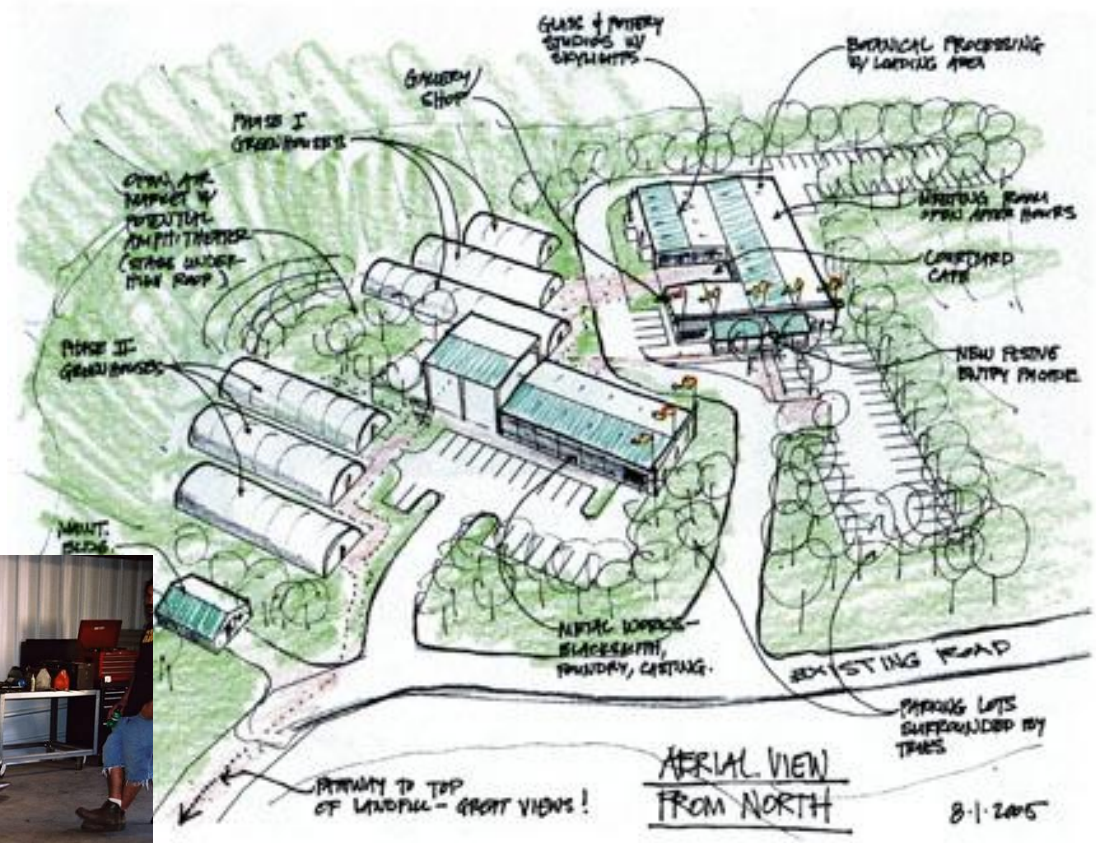
Direct-Use Case Study
Jackson County Green Energy Park
Sylva, NC

LMOP 2006 *Project of the Year*



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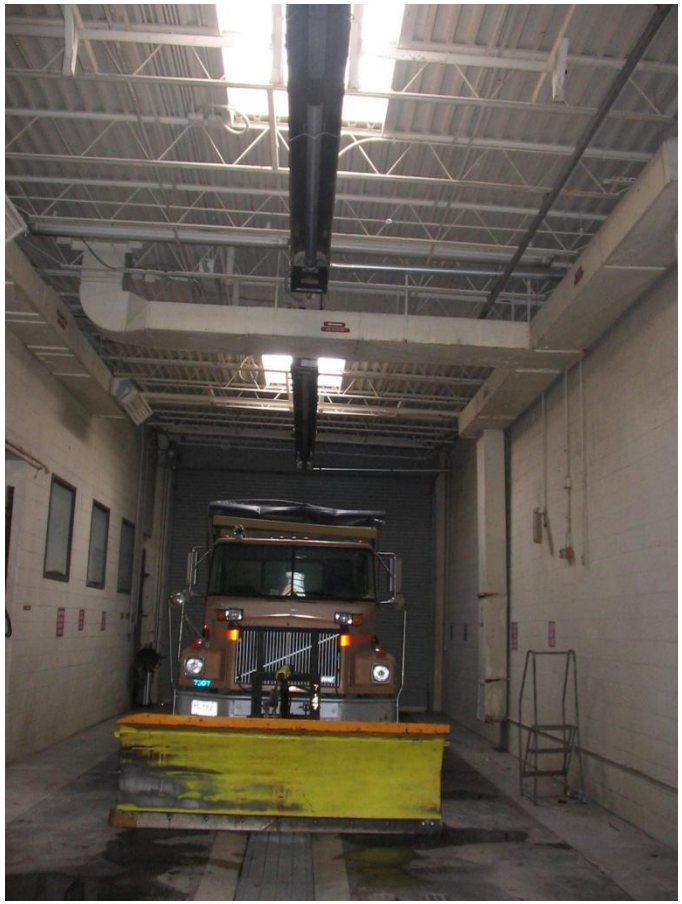
Infrared Heaters

- Used to heat storage and maintenance facilities
- Requires very little LFG to heat large spaces (10-20 cfm)
- Projects gaining popularity in the U.S. with over five operational projects in the US
- Two pilot projects internationally in Ukraine and Argentina

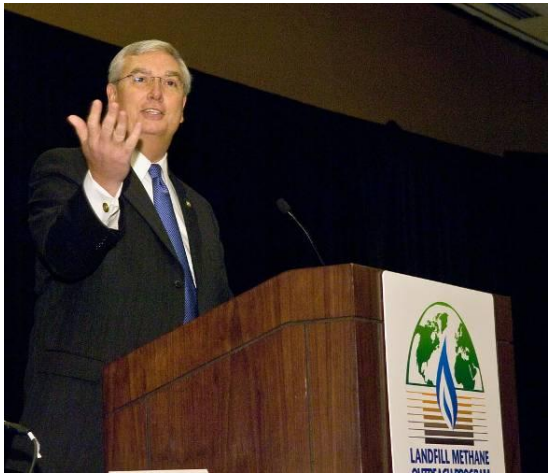


How Can We Work Together? Direct Project Assistance

- Analyze landfill resource – gas modeling
- Identify potential matches – *LMOP Locator*
- Assess landfill and end user facilities
- Look at project possibilities
  - Direct-use (boiler, heating, cooling, direct thermal)
  - Combined Heat & Power (engine, turbine, microturbine)
  - Electric (engine, turbine, microturbine)
  - Alternative Fuels (medium or high Btu, LNG, CNG)
- Initial feasibility analyses – *LFGcost*

LMOP Tools and Services

- Network of 700+ Partners (and growing)
- Newsletter and listserv
- Direct project assistance
- Technical and outreach publications
- Project and candidate landfill database
- Web site (epa.gov/lmop)
- Support for ribbon cuttings and
- other public relations
- Presentations at conferences
- State training workshops
- LMOP's 15th Annual Conference, January 2012 in Baltimore, MD.



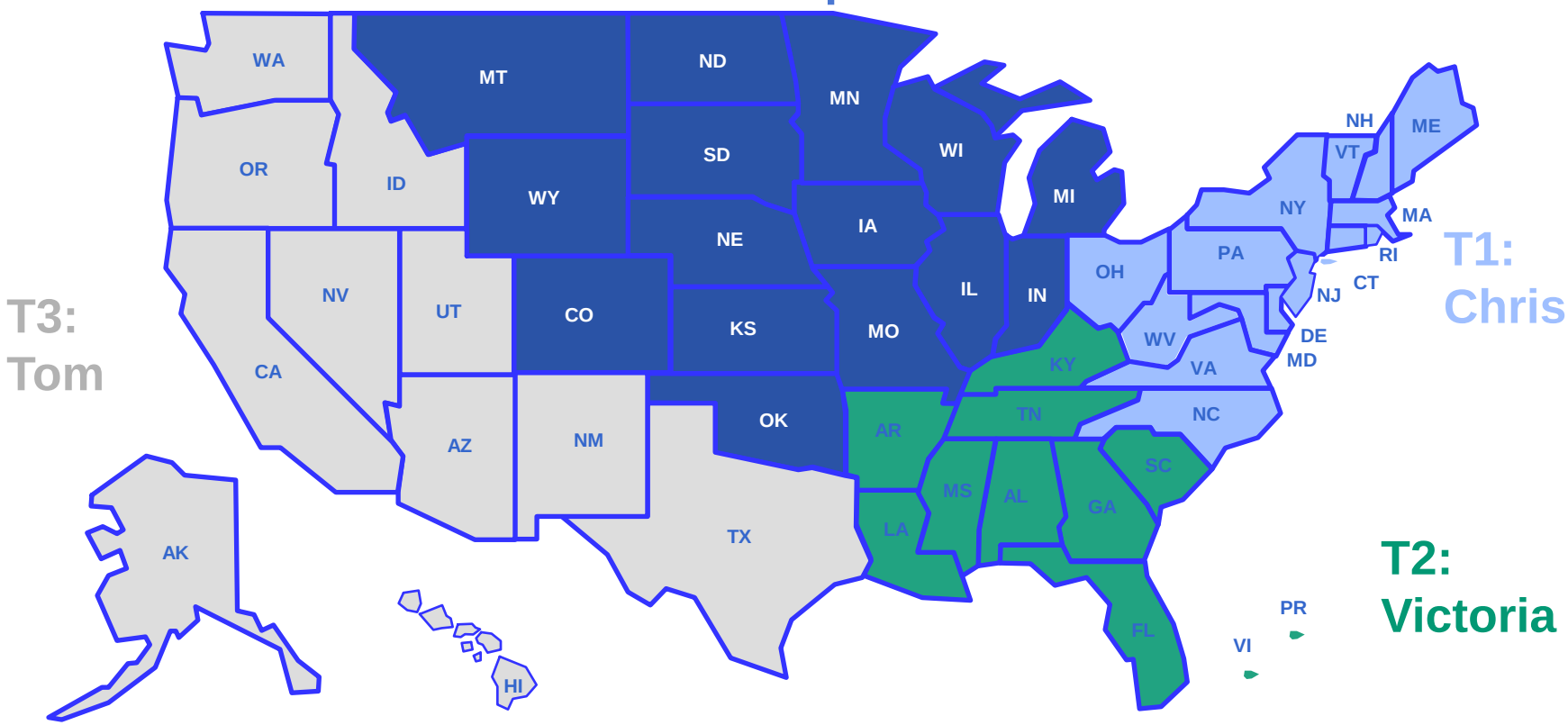
EPA Administrator
Stephen L. Johnson

Keynote Speaker
11th Annual LMOP Conference
Washington, DC

January 9, 2008

For More Information

www.epa.gov/lmop



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